

VICTOR

Owner's Guide 930-2 Scientific Calculator

KEY INDEX

GENERAL KEYS

KEY	Functions	Page
0-9	Data entry	16
+ - × ÷ =	Basic calculation	16
AC	All clear	7
C/CE	Clear/Clear error	12
+/-	Sign change	16

MEMORY KEYS

KEY	Functions	Page
RM	Independent memory recall	18
X-M	Independent memory in	18
X↔M	Exchange of display data and contents of M	18
M+	Memory plus	18

SPECIAL KEYS

KEY	Functions	Page
INV	Inverse	8
MODE	Mode	7
()	Parenthese	16
EXP	Exponent	11

KEY	Functions	Page
π	Pi	28
$\text{DEG} \leftrightarrow \text{DMS}$	Seagesimal notation / decimal notation conversion	28
DRG	Mode of angle DEG \rightarrow RAD \rightarrow GRAD \rightarrow DEG	29
$\text{DRG} \rightarrow$	Angular conversion of data DEG \rightarrow RAD \rightarrow GRAD \rightarrow DEG	29
$\text{X} \leftrightarrow \text{Y}$	Register exchange	33
\rightarrow	Clearing the last entered digit	12
FIX	Fix the number of digits after decimal point	33
FLO	Floating notation	33
SCI	Scientific notation	33
ENG	Engineering notation	33

BASE - N KEYS

KEY	Functions	Page
DEC	Decimal	21
BIN	Binary	21
HEX	Hexadecimal	21
OCT	Octal	21
$\text{A} - \text{F}$	Hexadecimal numbers entry	21
AND	And	26
OR	Or	26
XOR	Exclusive Or	26
XNOR	Exclusive Nor	26
NOT	Not	26
NEG	Negative	24

FUNCTION KEYS

KEY	Functions	Page
\sin	Sine	29
\cos	Cosine	29
\tan	Tangent	29
\sin^{-1}	Arc sine	29
\cos^{-1}	Arc cosine	29
\tan^{-1}	Arc tangent	29
HYP	Hyperbolic	30
\log	Common logarithm	31
10^x	Common antilogarithm	31
\ln	Natural logarithm	31
e^x	Natural antilogarithm	31
$\sqrt{\quad}$	Square root	32
x^2	Square	32
$\text{ABC}, \text{D/C}$	Fraction	19
$\sqrt[3]{\quad}$	Cube root	32
$1/x$	Reciprocal	32
$n!$	Factorial	32
y^x	Power	31
$\sqrt[y]{\quad}$	Root	31
$\text{R} \rightarrow \text{P}$	Rectangular to polar	34
$\text{P} \rightarrow \text{R}$	Polar to rectangular	33
$\%$	Percent	20

STATISTICAL KEYS

KEY	Functions	Page
SD	Statistical data mode	35
DATA	Data entry	35
DEL	Data delete	35
σ_n	Sample standard deviation	35
σ_{n-1}	Population standard deviation	35
\bar{x}	Arithmetic mean	35
n	Number of data	35
$\sum x$	Sum of value	35
$\sum x^2$	Sum of square value	35

Preface

Congratulations on your purchase of the 930-2 scientific calculator from Victor Technology. Victor has been serving customers since 1918. Today, Victor offers a complete line of printing, handheld, desktop, scientific, and financial calculators. For more information please see our website at www.victortech.com or call us at 1-800-628-2420.

Victor: The Choice of Professionals

A Spanish version of this instruction manual is available at www.victortech.com.

Una versión en español de este manual de instrucciones está disponible en www.victortech.com.

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INDEX

1. GENERAL GUIOE	7
2. OROER OF OPERATIONS ANO LEVELS	10
3. CALCULATION RANGE AND SCIENTIFIC NOTATION	11
4. CORRECTIONS	12
5. OVERFLOW OR ERROR CHECK	13
6. BATTERY REPLACEMENT	14
7. NORMAL CALCULATIONS	16
8. BINARY / OCTAL / OECIMAL / HEXAOECIMAL CALCULATIONS	21
9. FUNCTION CALCULATIONS	28
10. STATISTICAL CALCULATIONS	35
11. SPECIFICATIONS	38

1. GENERAL GUIDE

1-1) Modes

To put the calculator into a desired operating mode, press **MODE** first, then **BIN**, **OCT**, **DEC**, **HEX** or **SD**

MODE **BIN** - "BIN" is displayed. Calculations and conversions are performed in the Base-2 mode (Binary).

MODE **OCT** - "OCT" is displayed. Calculations and conversions are performed in the Base-8 mode (Octal).

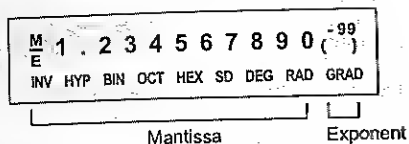
MODE **DEC** - Calculations and conversions are performed in the Base-10 mode (Decimal).

MODE **HEX** - "HEX" is displayed. Calculations and conversions are performed in the Base-16 mode (Hexadecimal).

MODE **SD** - "SD" is displayed. Change to the statistical calculations mode.

Pressing of **AC** key at any moment will clear all the memories and display contents and return the calculator to Bass-10 mode (Decimal) and angular unit in DEG.

1-2) The display



LCD Diagram

The display shows input data, interim results and answers to calculations. The mantissa section displays up to 10 digits. The exponent section displays up to ± 99 .

-E-	Error Indication (see page 13)
INV	Pressing of INV
M	Something is being stored in the memory (see page 18)
HYP	Pressing of HYP (see page 30)
BIN, OCT, HEX	BASE-N mode (see page 21)
SD	Statistical calculations (see page 35)
DEG, RAD, GRAD	Angular unit (see page 29)
FIX	Decimal places of a displayed value is being designated (see page 33)
SCI	Converts a displayed value to exponent display (see page 33)

ENG

Converts a displayed value to exponent display of which exponent is a multiple of 3 and mantissa is between 0 to 999 (see page 33).

FLO

Convert a SCI or ENG form display to normal display value (see page 33).

45_12_1123

45-12/23 (see page 29)

12°3'45.6"

12°3'45.6" (see page 29)

Exponent displays

The display can show calculation results only up to 10 digits long. When an intermediate value or a final result is longer than 10 digits, the calculator automatically switches over to exponential notation. Values greater than 9,999,999,999 are always displayed exponentially.

2. ORDER OF OPERATIONS AND LEVELS

Operation are performed in the following order of precedence :

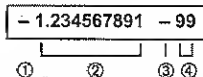
- | | | |
|--|------------------|---------------|
| 1. Functions | 4. +, - |] BASE-N mode |
| 2. y^x , $\sqrt[y]{x}$, $R \rightarrow P$, $P \rightarrow R$ | 5. AND | |
| 3. \times , \div | 6. OR, XOR, XNOR | |

Operations with the same precedence are performed from left to right, with operations enclosed in parentheses performed first. If parentheses are nested, the operations enclosed in the innermost set of parentheses are performed first.

3. CALCULATION RANGE AND SCIENTIFIC NOTATION



When the answer exceeds the normal display capacity, it is automatically shown by scientific notation, 10-digit mantissa and exponents of 10 up to ± 99 .



1. The minus (-) sign for mantissa
2. The mantissa
3. The minus (-) sign for exponent
4. The exponent of ten

The whole display is read : $-1.234567891 \times 10^{-99}$

* Entry can be made in scientific notation by using the **EXP** key after entering the mantissa.

6. BATTERY REPLACEMENT

• Power source

This calculator uses two power sources : a silicon solar cell and a alkaline manganese battery (LR43)

• When to replace battery

Memory contents disappear or when the display darkens under poor light conditions and cannot be restored by pressing the **AC** key.

• Precautions about battery

Improper handling of the battery may cause battery fluid leakage or explosion. So keep the following in mind :

- Look at "+" on battery to make sure the battery is installed in the correct orientation.
- Do not leave exhausted battery in calculator. Fluid may leak from the battery and damage the calculator.
- Should the battery fluid leak, wipe it off completely from the case.
- Do not throw the battery in fire or into water, otherwise it may explode.
- Keep the battery out of the reach of children.

• Battery replacement procedure

- a) Remove one screw on the back of the calculator.
Then, slide the body slightly toward the direction of the arrow. (Fig.1)



BE CAREFUL NOT TO LOSE THESE SCREWS.

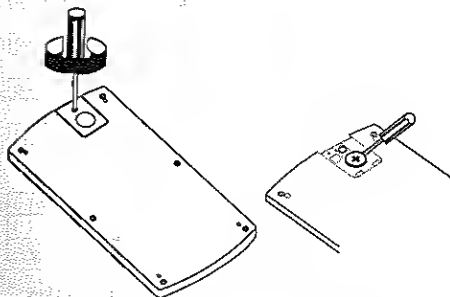
b) Slide the calculator back casing slightly and lift it to remove.

c) Use a ball-point pen to remove the old battery as shown below. (Fig.2)

d) Install new battery so that the (+) side points upward.

e) Put back the back casing and tighten the four screws.

f) Check to see if the following is displayed. If not, or nothing is displayed, repeat the above procedure all over again.



slide to open

Fig 1

Fig 2

7. NORMAL CALCULATIONS

- Calculations can be performed in the same sequence as the written formula (true algebraic logic).
- Nesting of up to 15 parentheses at 6 levels is allowed.

7-1) Four basic calculations (incl. parenthesis calculations)

EXAMPLE	OPERATION	READ-OUT
$23 + 4.5 - 53 =$	23 (+) 4 (=) 53 (=)	-25.5
$56 \times (-12) + (-2.5) =$	56 (x) 12 (+/-) (+) 2 (=) 5 (+/-) (=)	268.8
$2+3 \times (1 \times 10^{20}) =$	2 (+) 3 (x) 1 (EXP) 20 (=)	6.666666667 19
$7 \times 8 - 4 \times 5 (= 56 - 20) =$	7 (x) 8 (=) 4 (x) 5 (=)	36
$1 + 2 - 3 \times 4 + 5 + 6 =$	1 (+) 2 (=) 3 (x) 4 (+) 5 (+) 6 (=)	6.6
$\frac{6}{4 \times 5} =$	4 (x) 5 (=) 6 (INV) (x/y) (=)	0.3
$2 \times (7 + 6 \times (5 + 4)) =$	2 (x) () 7 (+) 6 (x) () 5 (+) 4 () (=)	0 () 0 () 122

* It is unnecessary to press the () key before the (=) key.

$$10 - (7 \times (3 + 6)) =$$

10 (=) () 7 (x) () 3 (+) 6 (=) -53

7-2) Constant calculations

$$3 + 2.3 =$$

3 (+) (+) 2 (=) 3 (=) 5.3

$$6 + 2.3 =$$

6 (=) 8.3

$$2.3 \times 12 =$$

2 (=) 3 (x) (x) 12 (=) 27.6

$$(-9) \times 12 =$$

9 (+/-) (=) -108

$$17 + 17 + 17 + 17 =$$

17 (+) (+) (=) 34

(=) 51

(=) 68

$$1.7^2 =$$

1 (=) 7 (x) (x) (=) 2.89

$$1.7^3 =$$

(=) 4.913

$$1.7^4 =$$

(=) 8.3521

$$4 \times 3 \times 6$$

4 (x) (x) () 3 (x) 6 (=) 72

$$(-5) \times 3 \times 6$$

5 (+/-) (=) -90

$$\frac{56}{4 \times (2+3)} =$$

56 (+) (+) () 4 (x) () 2 (+) 3 (=) 2.8

$$\frac{23}{4 \times (2+3)} =$$

23 (=) 1.15

7-3) Memory calculations using the independent memory

- When a new number is entered into the independent memory by the $(X \rightarrow M)$ key, the previous number stored is automatically cleared and the new number is put in the independent memory.
- The "M" sign appears when a number is stored in the independent memory.
To clear the contents press $(0) (X \rightarrow M)$ or $(AC) (X \rightarrow M)$ in sequence.
- The content of "M" and display data are exchanged by the $(X \leftrightarrow M)$ key.

53+6 = 59	53 $(+)$ 6 $(=)$ $(X \rightarrow M)$	M 59.
23-8 = 15	23 $(-)$ 8 $(=)$ $(M \rightarrow)$	M 15.
56x2 = 112	56 (\times) 2 $(=)$ $(M \rightarrow)$	M 112.
99+4 = 24.75	99 $(+)$ 4 $(=)$ $(M \rightarrow)$	M 24.75
210.75	(RM)	M 210.75

$$7+7-(2 \times 3)+(2 \times 3)-(2 \times 3) =$$

7 $(X \rightarrow M)$ $(M \rightarrow)$ $(+/-)$ $(M \rightarrow)$ 2 (\times) 3	
$(=)$ $(M \rightarrow)$ $(M \rightarrow)$ $(+/-)$ $(M \rightarrow)$ (RM)	M 19.

12x3 = 36	12 (\times) 3 $(=)$ $(X \rightarrow M)$	M 36.
-) 45x3 = 135	45 $(=)$ $(+/-)$ $(M \rightarrow)$	M -135.
78x3 = 234	78 $(=)$ $(M \rightarrow)$	M 234.
135	(RM)	M 135.

Continuing from above

2 $(+)$ 3 (\times) 4 $(INV) (X \leftrightarrow M) (=)$	M 407.
(RM)	M 4.

7-4) Fraction calculations

- Total of integer, numerator and denominator must be within 10 digits (Includes division marks).
- A fraction can be transferred to the memory.
- When a fraction is extracted, the answer is displayed as a decimal.
- A press of (AB/C) key after the $(=)$ key converts the fraction answer to the decimal scale.

$$4 \frac{5}{6} \times (3 \frac{1}{4} + 1 \frac{2}{3}) \div 7 \frac{8}{9} =$$

4 (AB/C) 5 (AB/C) 6 (\times) $(=)$ 3 (AB/C)	
1 (AB/C) 4 $(+)$ 1 (AB/C) 2 (AB/C) 3 $(=)$	3.7 J568.
$(+)$ 7 (AB/C) 8 (AB/C) 9 $(=)$	3.012323944
(AB/C)	3.7 J568.

$$2 \frac{4}{5} + \frac{3}{4} - 1 \frac{1}{2}$$

2 (AB/C) 4 (AB/C) 5 $(+)$ 3 (AB/C) 4 $(-)$	3.11 J20
(AB/C)	3.55
1 (AB/C) 1 (AB/C) 2 $(=)$	2.1 J20.

$$(1.5 \times 10^7) - \{(2.5 \times 10^6) \times \frac{3}{100}\} =$$

1 (\cdot) 5 (EXP) 7 $(-)$ 2 (\cdot)	
5 (EXP) 6 (\times) 3 (AB/C) 100 $(=)$	149250000.

- During a fraction calculation, a figure is reduced to the lowest terms by pressing a function command key $(+)$, (\times) , $(+/-)$, or $(-)$ or the $(=)$ key if the figure is reducible.

$$3 \frac{456}{78} = 8 \frac{11}{13} \text{ (Reduction)}$$

$$3 \text{ (A/C)} 456 \text{ (A/C)} 78 \text{ (A/C)} = 3 \text{ _ } 456 \text{ _ } 78 \text{ _ } \\ = 8 \text{ _ } 11 \text{ _ } 13$$

- By pressing **INV** **D/C** continuously, the displayed value will be converted to the improper fraction.

$$\frac{12}{45} - \frac{32}{56} =$$

$$12 \text{ (A/C)} 45 \text{ (A/C)} = 115 \text{ _ } 13 \text{ _ } \\ 32 \text{ (A/C)} 56 \text{ (A/C)} = 4 \text{ _ } 15 \text{ _ } \\ = -32 \text{ _ } 105 \text{ _ }$$

- The answer in a calculation performed between a fraction and a decimal is displayed as a decimal.

$$\frac{41}{52} \times 78.9 =$$

$$41 \text{ (A/C)} 52 \text{ (A/C)} \times 78.9 = 41 \text{ _ } 52 \text{ _ } \\ = 62.20561538$$

7-5) Percentage calculations

$$12\% \text{ of } 1500 \quad 1500 \text{ (x)} 12 \text{ (INV)} \% = 180$$

Percentage of 660 against 880

$$660 \text{ (+)} 880 \text{ (INV)} \% = 75$$

$$15\% \text{ add-on of } 2500 \quad 2500 \text{ (+)} 15 \text{ (INV)} \% = 375$$

$$= 2875$$

$$25\% \text{ discount of } 3500 \quad 3500 \text{ (-)} 25 \text{ (INV)} \% = 875$$

$$= 2625$$

If you made \$80 last week and \$100 this week, what is the percent of the new income to the old income?

$$100 \text{ (+)} 80 \text{ (INV)} \% = 125$$

(%)

$$12\% \text{ of } 1200 \quad 12 \text{ (INV)} \% \times 1200 = 144$$

$$18\% \text{ of } 1200 \quad 18 \text{ (INV)} \% = 216$$

$$23\% \text{ of } 1200 \quad 23 \text{ (INV)} \% = 276$$

$$26\% \text{ of } 2200 \quad 2200 \text{ (x)} 26 \text{ (INV)} \% = 572$$

$$26\% \text{ of } 3300 \quad 3300 = 858$$

$$26\% \text{ of } 3800 \quad 3800 = 988$$

Percentage of 30 against 192

$$30 \text{ (+)} 192 \text{ (INV)} \% = 15.625$$

$$\text{Percentage of } 156 \text{ against } 192 \quad 156 = 81.25$$

- How many percent is 138 grams to 150 grams?

- How many percent is 129 grams to 150 grams?

$$138 \text{ (+)} 150 \text{ (INV)} \% = 92$$

$$129 = 86$$

8. BINARY / OCTAL / DECIMAL / HEXADECIMAL CALCULATIONS

- Binary / octal / decimal / hexadecimal calculations and conversions are performed in the BASE-N mode.
- Base values are set by pressing one of the following keys:

KEY **BASE**

MODE **DEC** Decimal

MODE **HEX** Hexadecimal

MODE **BIN** Binary

MODE **OCT** Octal

- Calculation range after conversion

BASE	DIGITS	RANGE
Binary	10 digits	Positive : $0 \leq x \leq 111111111$ Negative : $1000000000 \leq x \leq 1111111111$
Octal	10 digits	Positive : $0 \leq x \leq 3777777777$ Negative : $4000000000 \leq x \leq 7777777777$
Decimal	10 digits	Positive : $0 \leq x \leq 9999999999$ Negative : $-9999999999 \leq x < 0$
Hexadecimal	10 digits	Positive : $0 \leq x \leq 2540BE3FF$ Negative : $FDABF41C0 \leq x \leq FFFFFFFF$

- Valid values

BASE	VALUE
Binary :	0, 1
Octal :	0, 1, 2, 3, 4, 5, 6, 7
Decimal :	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Hexadecimal :	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- Values other than noted above cannot be entered while each respective base is in effect. The letters B and D are displayed in lower case for hexadecimal.
- You cannot specify the unit of angular measurement (degrees, radians, grads) or the display format (FIX, SCI) while the calculator is in the BASE-N mode. Such specifications can only be made if you first exit the BASE-N mode.

8-1) Binary / Octal / Decimal / Hexadecimal conversions

Conversion of 22_{10} to binary

22 [MODE] [BIN] [ENT] 10110.

Conversion of 22_{10} to octal

[MODE] [OCT] [ENT] 26.

Conversion of 22_{10} to hexadecimal

[MODE] [HEX] [ENT] 16.

Conversion of 513_{10} to binary

513 [MODE] [BIN] [ENT] 0.

- Conversion may sometimes be impossible if calculation range of original value is greater than range of result value.

Conversion of $7FFFFFFF_{16}$ to decimal

[MODE] [HEX] 7FFFFFFF [MODE] [DEC] [ENT] 2147483647.

Conversion of 4000000000_8 to decimal

[MODE] [OCT] 4000000000 [MODE] [DEC] [ENT] -536870912.

Conversion of 123456_{10} to octal

123456 [MODE] [OCT] [ENT] 361100.

Conversion of 1100110_2 to decimal

[MODE] [BIN] 1100110 [MODE] [DEC] [ENT] 102.

8-2) Negative expressions

- Negative values can be obtained by pressing the **NEG** key. The two's complement is produced for negation of binary, octal, decimal and hexadecimal values.

Negative of 1010_2

MODE **BIN** 1010 **INV** **NEG** **DISP** 111110110.

Conversion to decimal

MODE **DEC** **DISP** -10.

Negation of 1_2

MODE **BIN** 1 **INV** **NEG** **DISP** 111111111.

Negation of 2_8

MODE **OCT** 2 **INV** **NEG** **DISP** 777777776.

Negation of 34_{16}

MODE **HEX** 34 **INV** **NEG** **DISP** FFFFFFFC.

8-3) Binary / Octal / Decimal / Hexadecimal calculations

- Memory and parenthesis calculations can be used with binary, octal, decimal and hexadecimal number systems.

$$1011_2 + 11010_2 = 110001_2$$

MODE **BIN** 10111 **+** 11010 **=** **DISP** 110001.

$$123_8 \times ABC_{16}$$

$$= 37AF4_{16}$$

$$= 228084_{10}$$

MODE **OCT** 123 **x**

MODE **HEX** ABC **=** **DISP** 37AF4.

MODE **DEC** **DISP** 228084.

$$1F2D_{16} - 100_{10}$$

$$= 7881_{10}$$

$$= 1EC9_{16}$$

MODE **HEX** 1F2D **-**

MODE **DEC** 100 **=**

MODE **HEX**

$$7881.$$

$$1EC9.$$

$$7654_8 + 12_{10}$$

$$= 334.33..._{10}$$

$$= 516_8$$

MODE **OCT** 7654 **+**

MODE **DEC** 12 **=**

MODE **OCT**

$$334.333333$$

$$516.$$

- Fractional parts of calculation results are truncated.

$$110_2 + 456_8 \times 78_{10} + 1A_{16}$$

$$= 390_{16}$$

$$= 912_{10}$$

MODE **BIN** 110 **+** **MODE** **OCT** 456 **x**

MODE **DEC** 78 **+** **MODE** **HEX** 1A **=**

$$390.$$

MODE **DEC**

$$912.$$

- Multiplication and division are given priority over addition and subtraction in mixed calculations.

$$BC_{16} \times (14_{10} + 69_{10}) = 15604_{10}$$

$$= 3CF4_{16}$$

MODE **HEX** BC **x** **(** **MODE** **DEC**

$$14$$

+ 69 **)** **=**

$$15604.$$

MODE **HEX**

$$3CF4.$$

$$23_8 + 963_{10} = 982_{10}$$

MODE OCT 23 X→M + MODE DEC 963 = 982

$$23_8 + 101011_2 = 111110_2$$

RM + MODE BIN 101011 = 111110

$$2A56_{16} \times 23_8 = 32462_{16}$$

MODE HEX 2A56 X RM = 32462

8-4) Logical operations

- The AND, OR, XOR, XNOR, NEG and NOT keys can be used to perform the respective binary, octal, decimal and hexadecimal logical operations.

$$19_{16} \text{ AND } 1A_{16} = 18_{16}$$

MODE HEX 19 AND 1A = 18

$$1110_2 \text{ AND } 36_8 = 1110_2$$

MODE BIN 1110 AND MODE OCT 36 = 16

MODE BIN 1110 = 1110

$$23_8 \text{ OR } 61_8 = 63_8$$

MODE OCT 23 OR 61 = 63

$$120_{16} \text{ OR } 1101_2 = 12D_{16}$$

MODE HEX 120 OR MODE BIN 1101 = 100101101

MODE HEX 120 = 12d

$$5_{16} \text{ XOR } 3_{16} = 6_{16}$$

MODE HEX 5 XOR 3 = 6

$$2A_{16} \text{ XNOR } 5D_{16} = \text{FFFFFFF88}_{16}$$

MODE HEX 2A XNOR 5D = FFFFFFFF88

$$1010_2 \text{ AND } (A_{16} \text{ OR } 7_{16}) = 1010_2$$

MODE BIN 1010 AND (MODE HEX A

OR 7) =

HEX A

MODE BIN

BIN 1010

$$1A_{16} \text{ AND } 2F_{16} = A_{16}$$

MODE HEX 1A AND AND 2F = A

$$3B_{16} \text{ AND } 2F_{16} = 2B_{16}$$

3B = 2b

$$\text{NOT of } 10110_2$$

MODE BIN 10110 NOT BIN 111101001

$$\text{NOT of } 1234_8$$

MODE OCT 1234 NOT OCT 777776543

$$\text{NOT of } 2FFFD_{16}$$

MODE HEX 2FFFD NOT HEX FFFFd00012

9. FUNCTION CALCULATIONS

Scientific function keys can be utilized as subroutines of four basic calculations (including parenthesis calculations).

- This calculator computes as $\pi = 3.141592654$ and $e = 2.718281828$
- In some scientific functions, the display disappears momentarily while complicated formulas are being processed. So do not enter numerals or press the function key until the previous answer is displayed.
- You cannot specify the unit of angular measurement (degrees, radians, grads) or the display format (FIX, SCI) while the calculator is performing BASE-N calculation. Such specifications can only be made if you first exit the BASE-N mode by pressing the **[AC]** key.
- For each input range of the scientific functions, see page 39.

9-1) Sexagesimal \leftrightarrow Decimal conversion

The **[\rightarrow DEG]** key converts the sexagesimal figure (degree, minute and second) to decimal notation. Operation of **[INV] [\rightarrow DMS]** converts the decimal notation to the sexagesimal notation.

$$14^{\circ}25'36'' = 14 \cdot 2536 \cdot \text{[\rightarrow DEG]} \quad \boxed{14.42666667}$$

$$\text{[INV] [\rightarrow DMS]} \quad \boxed{14^{\circ}25'36''}$$

- For the DMS display format, the integer part of the display data is regarded as degree, 2 digits below the decimal point as minute, and 3rd digits and below as second. Therefore $14^{\circ}25'36'' = 14.2536$

$$\begin{array}{ccc} 14. & 25 & 36 \\ \text{Degree} & \text{Minute} & \text{Second} \end{array}$$

9-2) Angular conversion of data

$$45^{\circ} = 0.785398163 \text{ rad} = 50 \text{ grad}$$

$$\begin{array}{l} 45 \text{ [INV] [DRG]} \rightarrow \text{RAD} \quad \boxed{0.785398163} \\ \text{[INV] [DRG]} \rightarrow \text{GRAD} \quad \boxed{50} \\ \text{[INV] [DRG]} \rightarrow \text{DEG} \quad \boxed{45} \end{array}$$

9-3) Trigonometric / Inverse trigonometric functions

$$\sin\left(\frac{\pi}{6} \text{ rad}\right) = \text{"RAD"} \text{ [INV] } \pi \text{ [X] } 6 \text{ [=] [sin]} \quad \boxed{0.5}$$

$$\cos 63^{\circ}52'41'' = \text{"DEG"} \quad 63 \text{ [X] } 5241 \text{ [DEG]} \quad \boxed{63.87805556}$$

$$\text{[COS]} \quad \boxed{0.440283084}$$

$$\tan (-35 \text{ gra}) = \text{"GRAD"} \quad 35 \text{ [+/-] [tan]} \quad \boxed{0.612800788}$$

$$2 \cdot \sin 45^{\circ} \times \cos 65^{\circ} = \text{"DEG"} \quad 2 \text{ [X] } 45 \text{ [sin] [X] } 65 \text{ [cos] [=]} \quad \boxed{0.597672477}$$

$$\cot 30^{\circ} = \frac{1}{\tan 30^{\circ}} = \text{"DEG"} \quad 30 \text{ [tan] [1/X]} \quad \boxed{1.732050808}$$

$$\sec\left(\frac{\pi}{3} \text{ rad}\right) = \frac{1}{\cos\left(\frac{\pi}{3} \text{ rad}\right)}$$

"RAD" INV π \div 3 = COS $\frac{1}{x}$ 2.

$$\operatorname{cosec} 30^\circ = \frac{1}{\sin 30^\circ}$$

"DEG" 30 SIN $\frac{1}{x}$ 2.

$$\cos^{-1} \frac{\sqrt{2}}{2}$$

"RAD" 2 INV $\sqrt{}$ \div 2 = INV COS $^{-1}$ 0.785398163

$$\tan^{-1} 0.6104 =$$

"DEG" 0.6104 INV TAN $^{-1}$ 31.39989118
 INV DMS 31°23'59"6

9-4) Hyperbolic functions and inverse hyperbolic functions

$$\sinh 3.6 =$$

3 6 HYP SIN 18.28545536

$$\tanh 2.5 =$$

2 5 HYP TAN 0.986614298

$$\cosh 1.5 - \sinh 1.5 =$$

1 5 X \rightarrow M HYP COS - 2.352409615

RM HYP SIN = 0.22313016

IN -1.5

$$\sinh^{-1} 30 =$$

30 INV HYP SIN $^{-1}$ 4.094622224

$$\text{Solve } \tanh 4x = 0.88$$

$$x = \frac{\tanh^{-1} 0.88}{4}$$

0.88 INV HYP TAN $^{-1}$ \div 4 = 0.343941914

9-5) Common & Natural logarithms / Exponentiations (Common antilogarithms, Natural antilogarithms, Powers and Roots)

$$\log 1.23 (= \log_{10} 1.23) =$$

1 23 LOG 0.089905111

$$\text{Solve } 4^x = 64.$$

$$x = \frac{\log 64}{\log 4}$$

64 LOG \div 4 LOG = 3.

$$\ln 90 (= \log_e 90) =$$

90 LN 4.49980967

$$\log 456 + \ln 456 =$$

456 X \rightarrow M LOG $+$ RM LN = 0.434294481

$$10^{0.4} + 5 \cdot e^{-3} =$$

0.4 INV 10 x $+$ 5 X 3 \div INV e^x = 2.760821773

$$5.6^{2.3} =$$

5 6 \sqrt{x} 2 3 = 52.58143837

$$123^{1/7} (= \sqrt[7]{123}) =$$

123 INV $\sqrt[y]{x}$ 7 = 1.988647795

$$(78 - 23)^{12} =$$

(78 - 23) \sqrt{x} 12 \div = 1.305111829 - 21

$$3^{12} + e^{10} = 3 \text{ (y)} 12 \text{ (+)} 10 \text{ (INV)} e^x \text{ (=)} 553467.4658$$

$$\log \sin 40^\circ + \log \cos 35^\circ = 40 \text{ (sin)} \text{ (log)} \text{ (+)} 35 \text{ (cos)} \text{ (log)} \text{ (=)} -0.278567983$$

$$15^{1/5} + 25^{1/6} + 35^{1/7} = 15 \text{ (INV)} \text{ (1/y)} 5 \text{ (+)} 25 \text{ (INV)} \text{ (1/y)} 6 \text{ (+)} 35 \text{ (INV)} \text{ (1/y)} 7 \text{ (=)} 5.090557037$$

9-6) Square roots, Cube roots, Squares, Reciprocals & Factorials

$$\sqrt{2} + \sqrt[3]{3} \times \sqrt{5} = 2 \text{ (INV)} \sqrt{} \text{ (+)} 3 \text{ (INV)} \sqrt[3]{} \text{ (x)} 5 \text{ (INV)} \sqrt{} \text{ (=)} 5.287196909$$

$$\sqrt[3]{5} + \sqrt{-27} = 5 \text{ (INV)} \sqrt[3]{} \text{ (+)} 27 \text{ (+/-)} \text{ (INV)} \sqrt{} \text{ (=)} -1.290024053$$

$$123 + 30^2 = 123 \text{ (+)} 30 \text{ (x}^2 \text{)} \text{ (=)} 1023$$

$$\frac{1}{\frac{1}{3} - \frac{1}{4}} = 3 \text{ (1/x)} \text{ (-)} 4 \text{ (1/x)} \text{ (=)} \text{ (1/x)} 12$$

$$8! (= 1 \times 2 \times 3 \times \dots \times 7 \times 8) = 8 \text{ (INV)} \text{ (n!)} 40320$$

9-7) Miscellaneous functions (FIX, SCI, ENG, FLO)

$$1.234 + 1.234 = \text{"FIX2"} \text{ (INV)} \text{ (FIX)} 2 \text{ (1)} 234 \text{ (+)} 1.234 \text{ (=)} 2.468$$

$$1 \div 3 + 1 \div 3 = \text{"FIX2"} \text{ (INV)} \text{ (FIX)} 2 \text{ (1)} 3 \text{ (+)} 1 \text{ (INV)} \text{ (SCI)} 3.33 \text{ (-)} 1 \text{ (1)} 3 \text{ (=)} 6.67 \text{ (-)} 1 \text{ (INV)} \text{ (FLO)} 0.67 \text{ (=)} 0.666666666$$

$$123\text{m} \times 456 = 56088\text{m} \quad 123 \text{ (x)} 456 \text{ (=)} 56088$$

$$= 56.088\text{km} \quad \text{(INV)} \text{ (ENG)} 56.088 \text{ (03)}$$

$$7.8\text{g} + 96 = 0.08125\text{g} \quad 7 \text{ (x)} 8 \text{ (+)} 96 \text{ (=)} 0.08125$$

$$= 81.25\text{mg} \quad \text{(INV)} \text{ (ENG)} 81.25 \text{ (-)} 03$$

9-8) Polar to rectangular co-ordinates conversion

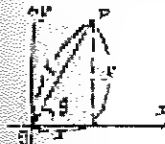
Formula : $x = r \cdot \cos \theta$ $y = r \cdot \sin \theta$
 Ex.) Find the value of x and y when the point P is shown as $\theta = 60^\circ$ and length $r = 2$ in the polar co-ordinates.

$$\text{"DEG"} 2 \text{ (INV)} \text{ (X} \cdot \text{Y)} 60 \text{ (INV)} \text{ (P} \cdot \text{R)} 1.732050808$$

$$\text{(x)} 1.732050808$$

$$\text{(y)} 1$$

$$\text{(x)} 1$$



9-9) Rectangular to polar co-ordinates conversion

Formula : $r = \sqrt{x^2 + y^2}$

$$\theta = \tan^{-1} \frac{y}{x} \quad (-180^\circ < \theta \leq 180^\circ)$$

Ex.) Find the length r and angle θ in radian when the point P is shown as $x = 1$ and $y = \sqrt{3}$ in the rectangular coordinates.



"RAD" 1 INV X \cdot Y 3 INV $\sqrt{}$ R \rightarrow P 2.

(r)

INV X \cdot Y 1.047197551

(θ in radian)

INV X \cdot Y 2.

(r)

10. STATISTICAL CALCULATIONS

- Set the function mode to "SD" by pressing

MODE SD

Ex.) Find $\hat{\sigma}_{n-1}$, $\hat{\sigma}_n$, \bar{x} , n , $\sum x$ and $\sum x^2$ based on the data 55, 54, 51, 55, 53, 53, 54, 52.

MODE SD SS DATA 54 DATA 51

DATA 55 DATA 53 X \rightarrow M DATA

RM DATA 54 DATA 52 DATA

SD 8.

(Sample standard deviation) INV $\hat{\sigma}_{n-1}$ SD 1.407885953

(Population standard deviation) INV $\hat{\sigma}_n$ SD 1.316956719

(Arithmetical mean) INV \bar{x} SD 53.375

(Number of data) INV n SD 8.

(Sum of value) INV $\sum x$ SD 427.

(Sum of square value) INV $\sum x^2$ SD 22805.

Note : The sample standard deviation $\hat{\sigma}_{n-1}$ is defined as

$$\sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}}$$

the population standard deviation $\hat{\sigma}_n$ is defined as

$$\sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n}}$$

and the arithmetical mean \bar{x} is defined as

$$\frac{\sum x}{n}$$

- Pressing \hat{O}_{n-1} , \hat{O}_n , \bar{x} , n , $\sum x$, $\sum x^2$ key need not be done sequentially.

Ex.) Find n , \bar{x} & \hat{O}_{n-1} based on the data : 1.2, -0.9, -1.5, 2.7, -0.6, 0.5, 0.5, 0.5, 1.3, 1.3, 1.3, 0.8, 0.8, 0.8, 0.8, 0.8.

MODE SD 1 \cdot 2
DATA \cdot 9 \pm/\mp DATA SD 2.

(1) (Mistake) 2 \cdot 5 \pm/\mp SD -2.5

(1) (To correct) CCE SD 0.
1 \cdot 5 \pm/\mp DATA SD 3.
2 \cdot 7 DATA SD 4.

(2) (Mistake) DATA SD 5.

(3) (Mistake) 1 \cdot 6 \pm/\mp DATA SD 6.

(3) (To correct) 1 \cdot 6 \pm/\mp INV DEL SD 5.
 \cdot 6 \pm/\mp DATA SD 6.

(2) (To correct) 4 INV DEL SD 5.
 \cdot 5 X SD 0.5
4 DATA SD 9.

(4) (Mistake)

1 \cdot 4 X SD 1.4

(4) (To correct)

CCE SD 0.
1 \cdot 3 X 3 DATA SD 12.
 \cdot 8 X SD 0.8

(4) (Mistake)

6 DATA SD 18.

(5) (To correct)

\cdot 8 X 6 INV DEL SD 12.
 \cdot 8 X 5 DATA SD 17.
INV n SD 17.
INV \bar{x} SD 0.635294117
INV \hat{O}_{n-1} SD 0.95390066

11. SPECIFICATIONS

BASIC OPERATIONS

4 basic calculations, constants for $+/-/x/÷/y^x/\sqrt{y}/$
AND / OR / XOR / XNOR / NEG, parenthesis
calculations and memory calculations.

BUILT-IN FUNCTIONS

Trigonometric / inverse trigonometric functions (with
angle in degrees, radians or grads), hyperbolic / inverse
hyperbolic functions, common / natural logarithms,
exponential functions (common antilogarithms, natural
antilogarithms), powers, roots, square roots, cube roots,
squares, reciprocals, factorials, conversion of coordinate
system (R→P, P→R), π , fractions, percentages, binary,
octal, decimal and hexadecimal calculations and logical
operations.

STATISTICAL FUNCTIONS

Sample standard deviation, Population standard
deviation, Arithmetical mean, Number of data, Sum of
value and Sum of square value.

MEMORY

1 independent memory.

CAPACITY

Entry / basic calculations

10-digit mantissa, or 10-digit mantissa plus 2-digit
exponent up to $10^{±99}$.

Fraction calculations

Total of integer, numerator and denominator must be
within 10 digits (includes division marks).

Scientific functions Input range

$\sin x / \cos x / \tan x$	$ x < 4.5 \times 10^{10}$ degrees ($< 25 \times 10^7 \pi$ rad, $< 5 \times 10^{10}$ grad)
$\sin^{-1} x / \cos^{-1} x$	$ x \leq 1$
$\tan^{-1} x$	$ x < 10^{100}$
$\sinh x / \cosh x$	$ x \leq 230.2585092$
$\tanh x$	$ x < 10^{100}$
$\sinh^{-1} x$	$ x < 5 \times 10^{99}$
$\cosh^{-1} x$	$1 \leq x < 5 \times 10^{99}$
$\tanh^{-1} x$	$ x < 1$
$\log x / \ln x$	$10^{-99} \leq x < 10^{100}$
e^x	$-10^{100} < x \leq 230.2585092$
10^x	$-10^{100} < x < 100$
y^x	$\begin{cases} y > 0 \rightarrow -10^{100} < x \cdot \log y < 100 \\ y = 0 \rightarrow x > 0 \\ y < 0 \rightarrow x : \text{integer or } 1/2n + 1 \\ \quad (n : \text{integer}) \end{cases}$
\sqrt{y}	$\begin{cases} y > 0 \rightarrow x \neq 0 : -10^{100} < 1/x \cdot \log y \\ \quad < 230.2585092 \\ y = 0 \rightarrow x > 0 \\ y < 0 \rightarrow x : \text{odd number or } 1/n \\ \quad (n : \text{integer}) \end{cases}$

\sqrt{x}	$0 \leq x < 10^{100}$
x^2	$ x < 10^{50}$
$\sqrt[3]{x}$	$ x < 10^{100}$
$1/x$	$ x < 10^{100} (x \neq 0)$
$n!$	$0 \leq x < 69 (x: \text{integer})$
REC \rightarrow POL	$\sqrt{x^2 + y^2} < 10^{100}$
POL \rightarrow REC	$ \theta < 4.5 \times 10^{10} \text{ degrees}$ $(< 25 \times 10^7 \pi \text{ rad}, < 5 \times 10^{10} \text{ grad})$
	$0 \leq r \leq 10^{100}$
DMS \rightarrow DEG	$ x \leq 10^{100}$
DEG \rightarrow DMS	$ x \leq 10^7$
π	10 digits
Binary	Positive: $0 \leq x \leq 111111111$ Negative: $1000000000 \leq x \leq 1111111111$
Octal	Positive: $0 \leq x \leq 377777777$ Negative: $4000000000 \leq x \leq 777777777$
Decimal	Positive: $0 \leq x \leq 999999999$ Negative: $-999999999 \leq x < 0$
Hexadecimal	Positive: $0 \leq x \leq 2540BE3FF$ Negative: $FDABF41C01 \leq x \leq FFFFFFFF$

- Errors are cumulative with such internal continuous calculations as x^y , $\sqrt[y]{x}$, $n!$, $\sqrt[3]{x}$ so accuracy may be adversely affected.
- In $\tan x$, $|x| \neq 90^\circ \times (2n + 1)$, $|x| \neq \pi / 2 \text{ rad} \times (2n + 1)$, $|x| \neq 100 \text{ grad} \times (2n + 1)$ (n is an integer.)
- With $\sinh x$ and $\tanh x$, errors are cumulative and adversely affected when $x = 0$.

READ-OUT

Liquid crystal display, suppressing unnecessary 0's (zeros).

POWER SOURCE

Power source : solar cell, alkaline manganese battery (LR43).

AMBIENT TEMPERATURE RANGE

$0^\circ\text{C} - 40^\circ\text{C}$ ($32^\circ\text{F} - 104^\circ\text{F}$)

DIMENSIONS

155.5mmH x 76.5mmW x 16mmD

NET WEIGHT

102g